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Request for Specimens of Specialist Species of Saline Lagoons in the British Isles

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Saline lagoons are characterised as 'areas of typically (but not exclusively) shallow, coastal saline water, wholly or partially separated from the sea by sandbanks, shingle or, less frequently, rocks or other hard substrata. They retain a proportion of their water at low tide and may develop as brackish, fully saline or hyper-saline water bodies' (Bamber *et al.* 2001a). There are numerous sub-types of saline lagoons determined by the nature of the barrier, the size and shape of individual lagoons. Sizes can range from less than 1 hectare, (Keyhaven, Hampshire) to 800

hectares (Loch Stenness, Orkney). Large, narrow or convoluted lagoons support the most diverse biological communities (Covey 1999).

The level of water exchange from the open sea has been described by a water confinement index (Guelorget & Perthuisot 1992). The index ranges from 'freshwater with freshwater biota' to 'estuarine and beyond' to 'hypersaline with cyanobacterial mats'. All water bodies in the range have a free connection to the open sea with marine biota. In their paralic ecosystem the zones of Guelorget & Pethuisot are similar to the biological suite of species groups described by Bamber, 1992:

- Freshwater and low salinity species
- Lagoonal species
- Euryhaline specialist lagoonal species
- Stenohaline species
- Estuarine species pre-adapted to lagoonal conditions



Fig. 1: Map of British Lagoon sites, Ireland (Oliver 2005), Scotland (Covey 1999) and England and Wales (Bamber *et al.* 2001b).



Fig. 2: *Idotea chelipes*, dorsal view, *Uists*, NMSZ. 2013.034 (Image Bill Crighton NMS/SNH)



Fig. 3: *Idotea chelipes aesthetasc*. *Uist*, NMSZ.2013.034. (Image Bill Crighton NMS/SNH)

- Estuarine species incidental to lagoons.

Lagoons became important for policy development after the Council of European Communities (CEC 1992) EU designation, as a priority habitat, largely based on geomorphology (Habitats Directive, Annex 1). Many policy documents and surveys followed on from the work on coastal lagoons by Barnes in the 1980s, who described coastal lagoons as a neglected habitat (Barnes 1980, 1988, 1989 a&b). Some sub-types of lagoon found in the British Isles are rare elsewhere on European NE Atlantic coasts. The recognition of rarity led to a large proportion designated as Special Areas of Conservation (SACs) or Special Sites of Scientific Interest (SSSI). In the UK there are about 330 lagoon sites (JNCC 1995) and in Ireland 89 lagoon sites (Oliver 2005) but some sites may have more than one lagoon (Figure 1). In the UK a high proportion of the lagoon sites have been selected as SACs (Smith & Laffoley 1992; Bamber 1997; Brown *et al.* 1997). There are 25 SACs in the UK and 25 in Republic of Ireland (see Appendix 1).

Specialist Lagoon Fauna and Flora

Definitions of lagoons are complex as the data are inconsistent or poor, e.g., salinity rarely accounts for temporal variability. Consequently, an attempt to use biological communities as part of the definition has been attempted several times. This is also problematic as comprehensive verified data are not available. There are several lists of lagoon indicator or specialist species most

of which are based on an original British list produced by Barnes (1989a) although this largely ignored Scottish and Irish Lagoons. Over the next 25 years lists were compiled by Bamber *et al.* (1992, 2001a, b), Davidson *et al.* (1991), Healy *et al.* (1982) and Healy (1994), Oliver (2005) and Angus (in press). The lists had a different basis for inclusion of taxa which included indicator species and insects. Only published lists of euryhaline specialist lagoonal species have been included as described in the suite of zones (Bamber *et al.* 1992). The list re-produced in Table 1 does not include insects.

There is recognised taxonomic confusion within a number of phyla which has led to doubts about existing records or absence of records largely due to mis-identification, e.g., *Cerastoderma glaucum* (Bruguère, 1789). The specialist taxa are mostly very small, 2-3 mm, and the identification guides are not always helpful. For example, *Idotea chelipes* (Pallas, 1772) (Figure 2) is separated from other taxa on the presence of a single distal aesthetasc (Figure 3) and coxal plates whereas the identification guide is based on the shape of the telson. Another constraint is seasonality. For example, the Tasselweed *Ruppia cirrhosa* can only be identified with confidence in late summer when it is in flower. Consequently, most records of Tasselweed are recorded as *Ruppia* sp?.

Although there have been many surveys that included biological sampling, specimens have not been retained for comparison (BMT Cordah

Species	Notes
Plants	
<i>Chaetomorpha linum</i> (Müller) Kützing, 1845	A distinct form found in sheltered sites Bamber <i>et al.</i> (2001a)
<i>Cladophora battersii</i> Hoek, 1963	Only listed in Roden (1999)
<i>Chara baltica</i> Bruzelius, 1824	
<i>Chara canescens</i> Loiseleur-Deslongchamps, 1810*	
<i>Chara ?connivens</i> Salzmänn ex Braun, 1835	Only listed in Oliver (2005)
<i>Lamprothamnium papulosum</i> (Wallroth) Groves, 1916*	
<i>Tolypella nidifica</i> (Müller) Leonhardi, 1864	
<i>Ruppia maritima</i> Linnaeus, 1753	
<i>Ruppia cirrhosa</i> (Petagna) Grande, 1918	
Cnidaria	
<i>Pachycordyle navis</i> (Millard, 1959)*	
<i>Gonothyrea loveni</i> (Allman, 1859)	Unlikely specialist as it is also found sub-tidally to 200m
<i>Edwardsia ivelli</i> Manuel, 1975*	Probably extinct.
<i>Nematostella vectensis</i> Stephenson, 1935*	
<i>Cordylophora caspia</i> (Pallas, 1771)	
Annelida	
<i>Armandia cirrhosa</i> Filippi, 1861*	
<i>Alkmaria romijni</i> Horst, 1919 *	
<i>Ficopomatus enigmatus</i> (Fauvel, 1923)	Also common in estuaries/low salinity.
<i>Hediste diversicolor</i> (O.F. Müller, 1776)	Also common in estuaries/low salinity.
Crustacea	
<i>Cyprideis torosa</i> (Jones, 1850)	Only listed in Bamber (2001a)
<i>Gammarus chevreuxi</i> Sexton, 1913	
<i>Gammarus insensibilis</i> Stock, 1966*	
<i>Allomelita pellucida</i> (Sars, 1882)	Only listed in Oliver & Healy (1998)
<i>Leptocheirus hirsutimanus</i> (Bate, 1862)	Tentative record, Healy (1994)
<i>Monocorophium insidiosum</i> (Crawford, 1937)	
<i>Cyathura carinata</i> (Kroyer, 1847)	Tentative record, Healy (1994)
<i>Lekanesphaera hookeri</i> (Leach, 1814)	
<i>Jaera nordmandi</i> (Rathke, 1837)	Oliver & Healy (1998)
<i>Idotea chelipes</i> (Pallas, 1766)	
Mollusca	
<i>Rissoa membranaea</i> (Adams, 1800)	Lagoon variety, Oliver and Healy (1998)
<i>Littorina saxatilis</i> (Olivi, 1792)	Brackish ecotype, previously <i>Littorina tenebrosa</i>
<i>Onoba aculeus</i> (Gould, 1841)	
<i>Hydrobia acuta neglecta</i> Muus, 1963	
<i>Ecrobia ventrosa</i> (Montagu, 1803)	
<i>Caecum armoricum</i> de Folin, 1869	
<i>Haminoea navicula</i> (da Costa, 1778)	
<i>Tenellia adspersa</i> Nordmann, 1845*	
<i>Cerastoderma glaucum</i> (Bruguère, 1789)	
Bryozoa	
<i>Conopeum seurati</i> (Canu, 1928)	
<i>Victorella pavidata</i> Saville-Kent, 1870*	
* plants and animals currently protected under schedules 8 and 5 (respectively) of the Wildlife & Countryside Act, 1981	

Table 1: Specialist Lagoon Species after Barnes (1989a), Davidson *et al.* (1991), Oliver & Healy (1998), Healy (1982, 1994), Bamber *et al.* (1992, 2001a). All taxonomic names follow the World register of marine species (WoRMS).



Fig. 4: *Hydrobia acuta neglecta*, one of NMS.Z.2012.70 Anne's Point, Strangford Lough, coll. R Anderson 17th June 2012 (Image Bill Crighton, NMS)

2004; Thorpe *et al.* 1998). Without access to survey samples it is impossible to verify the records and confirm presence at particular localities. An example of this dilemma is hydrobiids, a group of mud snails, which have

been studied extensively by Barnes and others. (Barnes 1991, 1993, 1996, 1999, 2005; Barnes & Gandolfi, 1998; Bishop 1976; Fish & Fish 1981; McArthur 1998).

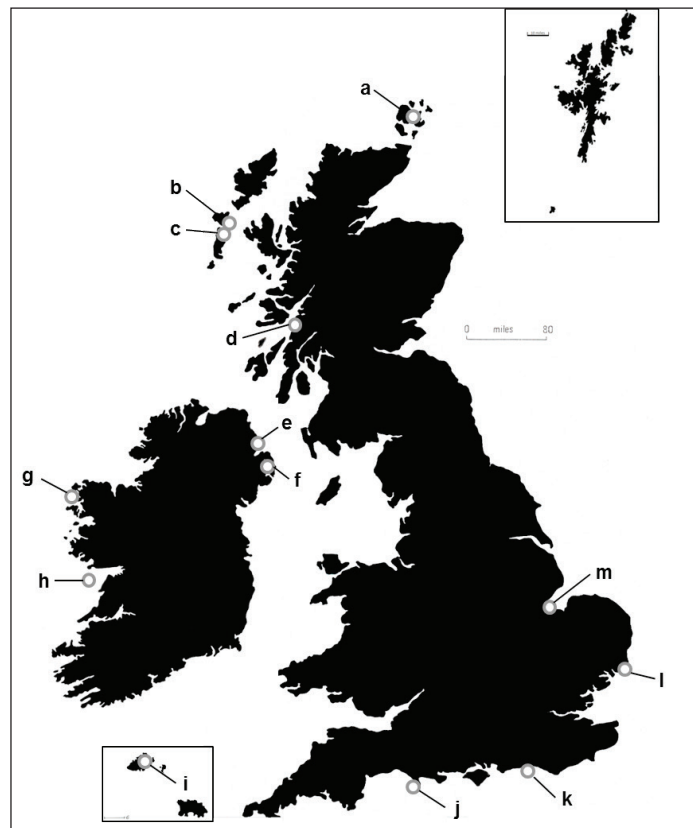


Fig. 5: Map of known *Hydrobia acuta neglecta* specimens in museum and personal collections. (see Table 2 for key)

Fig. 5 Ref.	Location	Accession Number	Preservative	Collector	
Scotland					
a	Oyce of Isbister	Orkney	NHM	Dry shells	
b & c	Loch an Dùin	North Uist	NMS.Z.2011.71	99% ethanol	SNH/NMS
	Loch an t-Sruith Mhoir				
	Oban a' Chlachain				
	Loch nam Madadh lagoons	Uists	NMS.Z.2013.34	75% denatured alcohol & 99% ethanol	SNH/NMS
	Oban a' Chlachain				
	Loch Euphort lagoons				
	Loch Bì	South Uist	NMS.Z.1970.26.11101	Dry shells	R Waterston
	West Loch Bì				
	Pool NW of Gashernish	South Uist	NMS.Z.1998.26.14	75% denatured alcohol	? R Covey
d	Seil Island	Argyll	NMS.Z.1999.9.105	75% denatured alcohol	? R Covey
Ireland					
e	Islandmagee	Antrim	MN806		
f	Ann's Point, Strangford Lough	Down	NMS.Z.2012.70	99% ethanol	R Anderson
g	Leam Lough	Mayo			J Nunn
h	Inishmore	Galway			J Nunn
Channel Islands					
i	Baie de Pulias	Guernsey	NHM	75% denatured alcohol	
	Pulias Pond, St. Sampson	Guernsey	LEEDM.C.1993.1.1	Dry shells	
England					
j	Fleet Lagoon	Dorset	NMS.Z.2001.111.1	75% denatured alcohol - poor condition	
k	Littlehampton	W Sussex	NHM	75% denatured alcohol	R Bamber
l	Aldeburgh Marshes	Suffolk	UMZC I 67192	75% denatured alcohol	Bishop
			NHM 2258		
m	Wyberton Marsh	Lincs	UMZC I 67192	75% denatured alcohol	
	Shingle Street	Suffolk	Genbank AF 278817.1		Wilke

Table 2: *Hydrobia acuta/neglecta* specimens held in museums or other institutes. NMS=National Museums Scotland, Edinburgh; NHM=Natural History Museum, London; LeedM=Leeds; UMZC=University Museum Zoology Cambridge; MN = Ulster Museum, Belfast.

There are 5 British Hydrobiids (Anderson 2008), all usually smaller than 5 mm and difficult to identify on shell shape alone. The 4 species frequently mis-identified are *Potamopyrgus antipodarum* Grey, 1843; *Ecrobia ventrosa* (Montagu, 1803), *Hydrobia acuta neglecta* Muus, 1963 and *Peringia ulvae* (Pennant, 1777). The distribution of specialist lagoon species *H. acuta neglecta* (Figure 4) is of particular interest for taxonomic research.

Identification guides are based on the shell characters, tentacle patterns and more recently penis shape. The tentacle patterns and penes are best observed in living specimens. Hydrobiid records have been published in the *Atlas of the Land and Freshwater Molluscs of Britain and Ireland* (Kerney, 1999), but specimens associated with Kerney's Humber and Ayrshire records have yet to be located. The National Biodiversity Network (www.nbn.org.uk).

org.uk) records are based mostly on sightings and may not have an associated specimen available for examination. There are only 17 locations from which specimens have been verified (Table 2, Figure 5).

Apart from the recent samples collected from North Uist and Ireland, most identifications are based on preserved dead specimens or dry shell characters. Many records need to be re-examined as shell characters alone are inadequate for identification, and often the soft tissues are not completely preserved and of little value. Identification is greatly enhanced if specimens are examined alive when the tentacles and head characters are easily visible. For subsequent examination of preserved specimens the shell needs to be cracked pre-preservation to allow penetration of formalin for complete fixation of tissue. The absence of well preserved, verified specimens available for examination means the distribution of *Hydrobia acuta neglecta* in the British Isles is largely unknown.

In 2011 and 2012 SNH commissioned two surveys to North Uist lagoons to collect specimens of *H. acuta/neglecta* and other lagoon specialist taxa (Chevalier *et al.* 2014; Howson *et al.* 2014) to provide well-preserved and documented specimens with georeferenced data. The specimens have been deposited at the National Museums Scotland. The presence of *H. acuta/neglecta* in the Outer Hebrides was confirmed.

Comments

As well as the type of barrier and their ephemeral nature, the physical and biological characters of lagoons are variable; temperature, salinity, acidity and species composition vary over time and location. Consequently, lagoons are not uniform but individual physiographic habitats which host rare species of significant conservation value (Bamber 1997). However, lagoons do not fit neatly into categories for the Water Framework Directive as a water body for monitoring as they are naturally variable and may even disappear due to natural causes or human impact (Bamber 2010). Government country agencies are responsible for biota surveillance and policy development. Planning

to monitor changes becomes futile without verifiable baseline information and knowledge of uniqueness.

Next steps

Specimens of all lagoon specialist taxa are required to obtain accurate data on their current distribution this would include all Crustacea, Polychaetes, *Cerastoderma* and *Ruppia* spp. If you collect any specimens, after obtaining relevant permissions, please keep them cool and damp and send to the above address.

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Appendix 1: List of UK lagoon sites designated as Special Areas of Conservation

Country	SAC Site Name	Local Authority
England	Benacre to Easton Bavents Lagoons	Suffolk
	Chesil and the Fleet	Dorset
	Dungeness	East Sussex; Kent
	Humber Estuary	City of Kingston upon Hull; East Riding of Yorkshire; Lincolnshire; North East Lincolnshire; North Lincolnshire
	Minsmere to Walberswick Heaths and Marshes	Suffolk
	Morecambe Bay	Cumbria; Lancashire
	North Norfolk Coast	Norfolk
	Orfordness - Shingle Street	Suffolk
	Solent and Isle of Wight Lagoons	City of Portsmouth; Hampshire; Isle of Wight
	Solent Maritime	City of Portsmouth; City of Southampton; Hampshire; Isle of Wight; West Sussex
The Wash and North Norfolk Coast	Lincolnshire; Norfolk	
England & Wales	Dee Estuary/ Aber Dyfrdwy	Cheshire; Sir y Fflint/ Flintshire; Wirral
Northern Ireland	Strangford Lough	Down
Republic of Ireland	Durnesh Lough	
	Ballyteige Burrow	
	Carrowmore Point to Spanish Point and Islands	
	Clew Bay Complex	
	Connemara Bog Complex	
	Drongawn Lough	
	Farranamanagh Lough	
	Galway Bay Complex	
	Gweedore Bay and Islands	
	Inishbofin and Inishshark	
	Inisheer Island	
	Inishmore Island	
	Kilkeran Lake and Castlefreke Dunes	
	Kilkieran Bay and Islands	
	Lady's Island Lake	
	Lough Cahasy, Lough Baun and Roonah Lough	
	Lough Swilly	
	Lower River Shannon	
	Mweelrea/Sheeffry/Erriff Complex	
	Rutland Island and Sound	
Slyne Head Peninsula		
Tacumshin Lake		
Termon Strand		
Tory Island Coast		
Tralee Bay and Magharees Peninsula, West to Cloghane		
Scotland	Loch nam Madadh	Western Isles / Na h-Eileanan an Iar
	Loch of Stenness	Orkney Islands
	Loch Roag Lagoons	Western Isles / Na h-Eileanan an Iar
	Obain Loch Euphoirt	Western Isles / Na h-Eileanan an Iar
	South Uist Machair	Western Isles / Na h-Eileanan an Iar
	Sullom Voe	Shetland Islands
	The Vadills	Shetland Islands
	Yell Sound Coast	Shetland Islands
Wales	Bae Cemlyn/ Cemlyn Bay	Ynys Môn/ Isle of Anglesey
	Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd	Abertawe/ Swansea; Caerfyrddin/ Carmarthenshire; Penfro/ Pembrokeshire
	Pembrokeshire Marine/ Sir Benfro Forol	Penfro/ Pembrokeshire
	Pen Llyn a'r Sarnau/ Llyn Peninsula and the Sarnau	Ceredigion; Gwynedd; Powys